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(71) Applicant: **ASE (UK) LIMITED**
Norfolk Street
Carlisle Cumbria CA2 5HX(GB)

(72) Inventor: **Burke, David**
34 Roseberry Road
Stanwix Carlisle Cumbria(GB)

(74) Representative: **Jones, Ian et al**
POLLAK MERCER & TENCH High Holborn
House 52-54 High Holborn
London WC1V 6RY(GB)

(54) Vehicle seat belt retractor with latching inhibition.

(57) A vehicle seat belt retractor has a belt-sensitive latch mechanism inhibited during belt retraction. A pawl (12) pivoted on the retractor spool (1) by a pivot pin (15) has a pawl pin (17) engaged in a slot in an inertia mass (10), which normally rotates with the spool but which lags when a predetermined belt acceleration is exceeded to pivot the pawl, by acting on the pin (17), to thereby effect locking. The inhibitor mechanism comprises a disc (25) driven by the pin (15) to rotate with the spool in different angular relationships depending on the direction of spool rotation and engaging the pawl pin (17) to prevent latching movement of the pawl when the spool rotates to retreat the belt.

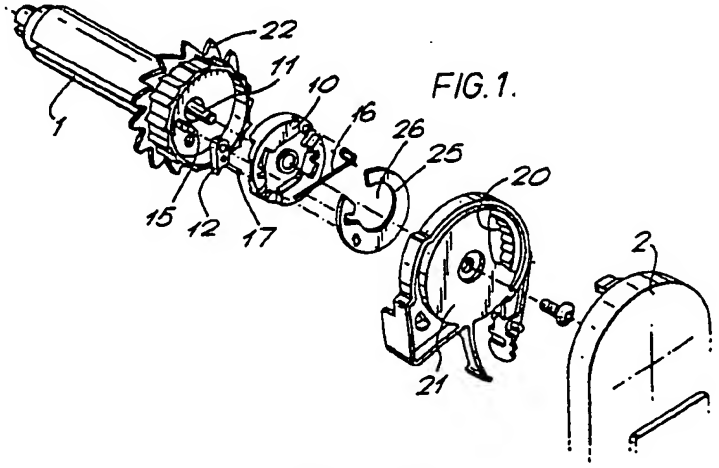

FIG. 1.

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VEHICLE SEAT BELT RETRACTOR WITH LATCHING INHIBITION

The invention relates to a retractor for us in a vehicle seat belt system, and in particular to the kind of retractor which incorporates a latch mechanism operable to latch the retractor against belt withdrawal therefrom in response to belt acceleration in excess of a predetermined amount.

Belt sensitive latching of such a retractor is required only in response to belt acceleration in the direction of belt withdrawal when the belt is in use. The belt sensitive latching mechanisms typically depend for operation on movement within the retractor of an inertia member, and the construction is such that latching can take place under conditions other than as required, when latching serves no useful purpose and may be a source of annoyance to the user, who may be obliged to take action to restore the retractor to free operation.

Belt-sensitive retractors have accordingly been designed to incorporate an inhibitor mechanism arranged to inhibit latch mechanism operation in a predetermined retractor condition, and the invention is concerned with the provision of a retractor incorporating an inhibitor mechanism which is effective and of particular simplicity.

A belt-sensitive retractor may comprise a rotatable spool from which the belt can be protracted for use, and onto which the belt can be retracted by a rewind spring, a latch mechanism for latching the spool against rotation in the belt protraction direction, the latch mechanism comprising an inertia mass rotatable with the spool during spool rotation corresponding to belt acceleration below a predetermined amount and arranged to lag relative to the spool on spool rotation corresponding to belt acceleration above the predetermined amount, a pawl pivotably mounted on the spool and engageable by the inertia mass when this lags on the spool so that the inertia mass causes pivoting of the pawl to effect latching.

The invention provides such a retractor in which an inhibitor mechanism is operated by and/or operates on elements of the latch mechanism substantially without or with only minor modification thereof.

The retractor of the invention may thus comprise an inhibitor member having a first position in which the pivoting of the pawl is prevented and a second position in which the pivoting of the pawl is permitted, the inhibitor member being moved to its positions by the means, for example, of a pivot pin, pivoting the pawl on the spool. The retractor of the invention may in another aspect comprise an inhibitor member having a first position in which the pivoting of th pawl is prevented and a second position in which th pivoting of the pawl is permitted. The pawl portion can be a pin or the like by which the inertia mass acts on the pawl to cause the pawl movement which effects latching.

Because of its operative relationship with the latch mechanism, the inhibitor mechanism can be embodied in a suitable retractor in a very simple manner in the form for example of a flat disc of appropriate shape to co-operate with the latch mechanism parts.

The inhibitor mechanism can be arranged to inhibit latch mechanism operation when belt movement is in the retraction or rewind direction. Belt rewind can then be effected at high speed without risk of inadvertent checking of the belt movement by operation of the latch mechanism.

The invention is moreover of particular utility where the belt extends upwardly from the retractor to an adjustable shoulder anchorage, conveniently of the kind described in EP 0 086 633A. Where the belt guide is moved to its lowest position in an uncontrolled manner, which movement is of course aided by the retractor rewind spring, the inertia member tends to bounce and would thereby effect locking were it not for the inhibitor mechanism. A certain length of belt would have had to be fed back into the retractor to effect unlatching, but the retractor would have been latched against belt withdrawal, and the belt guide cannot be moved to make a length of belt available, as the guide is at its lowest position.

The invention is further described below, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a partial exploded perspective view of a vehicle seat belt retractor with belt sensitive latching and an inhibitor mechanism in accordance with the invention;

Figure 2 is an axial view on a larger scale of the retractor of Figure 1 with the inhibitor in a first, free, position; and

Figure 3 is a view resembling that of Figure 2 but showing the inhibitor mechanism in a second, inhibiting, position.

The retractor shown in Figure 1 incorporates a latch mechanism of the kind described in EP 0 097 407A, to which reference should be made for further particulars. For present purposes, it is noted that the retractor comprises a spool 1 journalled in a frame (not shown) provided with a cover of which a part 2 only is included in the Figure. One end of the seat belt is secured to the spool 1, which is biassed by a rewind spring (not shown) to wind or retreat the b lt into the r tractor. At one end of the spool 1, an inertia mass 10 is journalled on a stub shaft 11 projecting coaxially outwardly of the spool,

and a pawl 12 is journalled on a pivot pin 15 which also projects from the spool in the axial direction, but at a position radially spac d from th stub shaft 11.

A spring wire 16 has one end secured on the inertia mass 10, and the other end engages the pin 15, so that the mass is driven by way of the spring wire to rotate with the spool, but is nevertheless capable of lagging with respect to it by flexure of the spring wire, when the spool rotation corresponds to a belt withdrawal acceleration exceeding a predetermined limit.

The pawl 12 is formed or provided with an axially projecting pawl pin 17 which is laterally spaced from the pin 15 and received in a slot in the inertia mass 10. The walls of the slot are shaped so that rotational lagging of the mass with respect to the spool 1 causes the pawl 12 to be pivoted radially outwardly on the pin 15, so that its free end can engage with internal teeth 20 provided on a lock cup 21. The lock cup 21 is normally stationary but is able to turn about the spool axis when coupled to the spool 1 to the pawl 12. Further spool rotation thus rotates the lock cup 21 and such rotation effects movement of a lockbar (not shown) so that the lockbar engages teeth of a ratchet wheel 22 carried by the spool 1 in such a way that spool rotation in the direction of belt unwinding, or protraction, is prevented.

In accordance with the present invention, an inhibitor mechanism comprises a thin, flat, shaped, disc 25 received within the lock cup 21, between the lock cup and the inertia mass 10. The disc 25 is guided by engagement of its outer periphery with the lock cup 21 for rotation about the spool axis, and is configured to provide angularly spaced radially extending drive abutments and a generally tangentially extending limiting abutment. As appears from Figures 2 and 3, these abutments are provided by two cut-outs, of which the larger cut-out 26 has the form of a recess extending inwardly from the disc periphery. The cut-out 26 has two spaced, generally radially extending, walls or edges 27 constituting the drive abutments, between which the pivot pin 15 projecting from the spool 1 is received. The inhibitor disc 25 is consequently driven by the pivot pin 15 to rotate with the spool but is capable of angular movement relative to the spool over a small range dictated by the angular spacing of the edges 27.

The smaller cut-out has a closed periphery as best shown in Figures 2 and 3 and comprises a radially wider portion 30 joined at a radially inward directed step to a radially narrower portion 31, of which the outer edge 32 constitutes a limiting abutment for the pawl pin 17, the free end of which extends through the slot in th inertia member 10 into the smaller cut-out.

As shown in Figure 2, rotation of the spool 1 in the direction corresponding to extraction of the b lt, takes place in th direction of th arrow A. The pin 15 then drives the inhibitor disc 25 in the same direction, so that the pawl pin 17 is in the wider portion 30 of the smaller cut-out. The pawl 12 is consequently free to pivot radially outwardly sufficiently far for its end to engage the lock-cup teeth 20, so that latching of the retractor against belt protraction or withdrawal can take place.

As shown in Figure 3, the inhibitor disc 25 takes a different angular relationship with the spool 1 when this is rotating in the direction to retract the belt, as indicated by the arrow B. The disc 25 remains stationary until the pivot pin 15 engages the other radial wall 27 of the larger cut-out 26. As a result, the pawl pin 17 finds itself in the radially narrow portion 31 of the smaller cut-out, and radially outward pivoting of the pawl 12 is prevented by the limiting abutment or edge 32 of the smaller cut-out. Retractor latching consequently cannot then take place, and this condition prevails until reversal of the spool direction of rotation of the spool 1, when belt withdrawal recommences, brings about a return to the condition shown in Figure 2.

It will be appreciated that the inhibitor mechanism consists essentially only of the disc 25, which is configured simply as a flat circular disc with appropriate internal shaping, and which co-operates with the pivot pin 15 and pawl pin 17, both of which are present in any event, as necessary elements of the latch mechanism of the retractor.

Although reference has been made only to the belt-sensitive latching function of the retractor illustrated it will be evident from EP 0 092 407 A that the retractors can be dual-sensitive in that latching against belt withdrawal is effected also by acceleration (or deceleration) of the retractors, and thus of vehicles in which they are mounted, in excess of a predetermined limit.

It will be evident that the invention can be carried into effect in a variety of ways other than those specifically described and illustrated.

Claims

1. A vehicle seat belt retractor comprising a spool (1) from which the belt can be protracted for use and onto which the belt can be retracted by a rewind spring, a latch mechanism for latching the spool against rotation in the belt protraction direction, the latch mechanism comprising an inertia mass (10) rotatable with the spool during spool rotation corresponding to belt acceleration below a predetermined limit and arranged to lag relative to the spool on spool rotation corresponding to belt

accel ration above th limit, a pawl (12) pivoted on the spool and movable by the inertia mass when the lagging thereof occurs to effect the latching of the spool, and inhibitor means (25) having a first position in which the pivoting of the pawl (12) is prevented and a second position in which the pivoting of the pawl is permitted, the inhibitor means being operated by or on at least one of means (15) pivoting the pawl (12) on the spool (1) and guide means (17) operative between the pawl (12) and the inertia mass (10) to effect the latching movement of the pawl.

2. A retractor as claimed in claim 1 wherein the inhibitor means (25) is operated on so as to have its first position during belt retraction and its second position during belt protraction.

3. A retractor as claimed in claim 1 wherein the means pivoting the pawl (12) on the spool (1) comprises a pivot pin (15) on which the pawl is journalled, the pin (15) extending in a direction spaced from but parallel to the spool rotation axis.

4. A retractor as claimed in claim 3 wherein the pivot pin (15) extends into driving engagement with the inhibitor means (25).

5. A retractor as claimed in claim 3 or 4 wherein the inhibitor means (25) is rotatable about the spool rotational axis between its positions, and has angularly spaced abutments (27) engageable by the pivot pin (15) so as to be driven by the pin to assume different angular positions relative to the spool (1) in the first and second positions.

6. A retractor as claimed in claim 3, 4 or 5 wherein the means operative between the pawl (12) and the inertia mass comprises a pawl pin (17) extending from the pawl in a direction spaced from but parallel to the spool rotational axis into engagement with the inertia mass (10).

7. A retractor as claimed in claim 6 wherein the inhibitor means (25) acts on the pawl pin (17) to prevent or permit the pivoting of the pawl (12).

8. A retractor as claimed in claim 6 or 7 wherein the inhibitor means (25) has an abutment (32) engageable with the pawl pin (17) in the first position of the inhibitor means only to prevent the latching pivotation of the pawl (12).

9. A retractor as claimed in any preceding claim wherein the inhibitor means comprises a flat disc (25) having recessed or cut-out portions (26, 30, 31) cooperable with the pawl pivoting means (15) and the guide means (13).

10. A retractor as claimed in any preceding claim wherein the inertia mass (10) is located between the spool (1) and a lock-up (21) having teeth (20) engageable by the pawl (12), and the inhibitor m ans (25) is a thin disc received between the inertia mass and the lock cup.

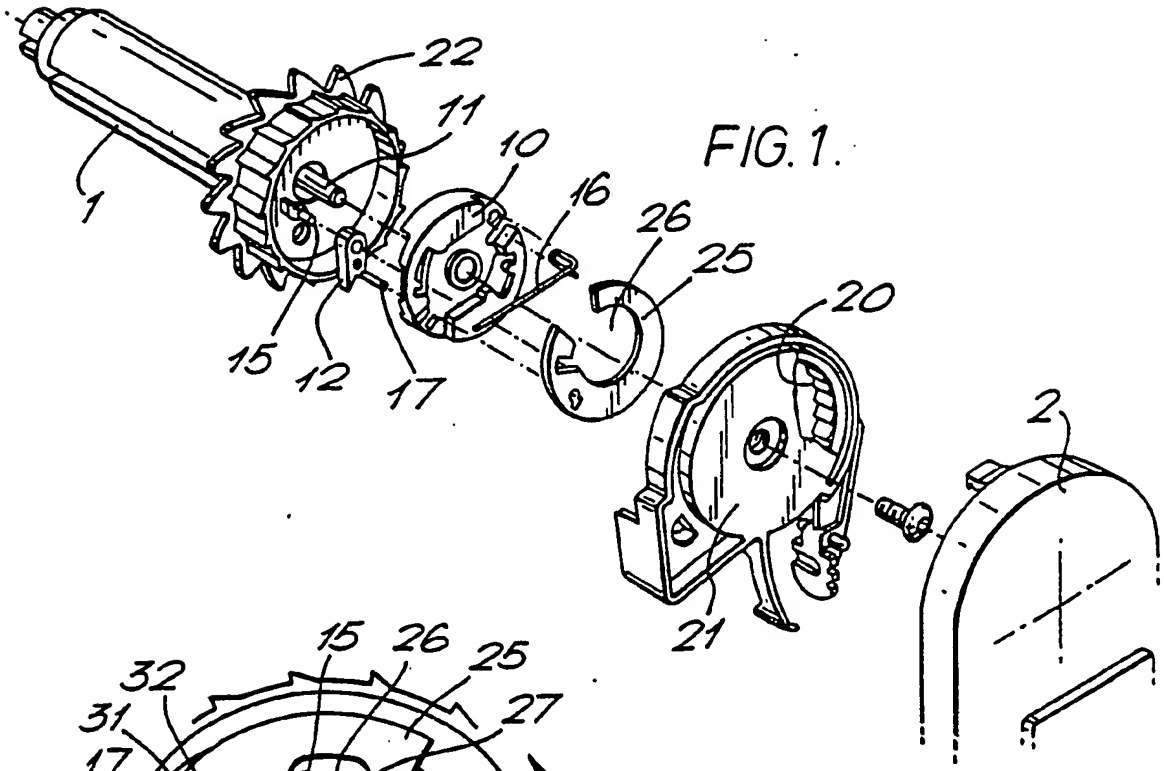

FIG. 1.

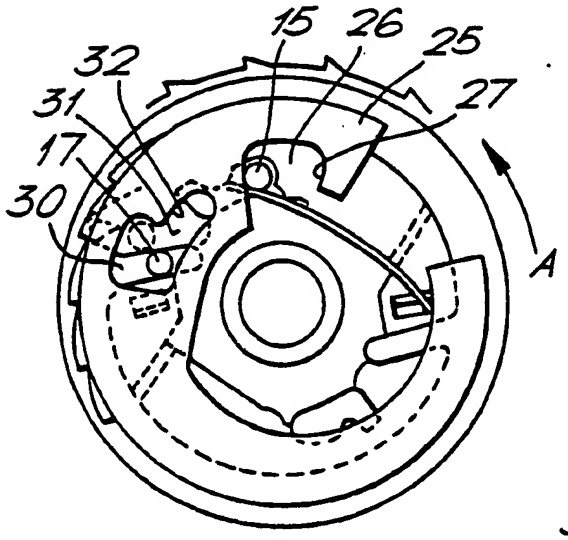

FIG. 2.

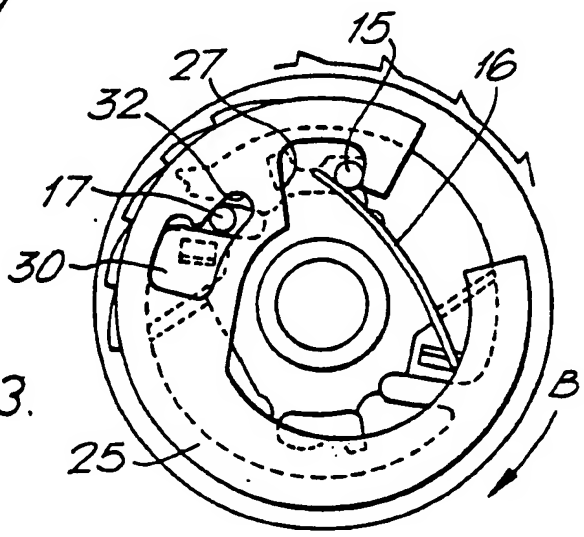

FIG. 3.

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EUROPEAN SEARCH REPORT

Application Number

EP 87 31 0398

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	GB-A-2 113 979 (KINZOKU) * Whole document * ---	1,2,6	B 60 R 22/38
A	US-A-3 711 037 (JAKOB) * Figures 1-5; column 4, line 32 - column 8, line 60 * -----	1,3,7,8	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

B 60 R

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	25-02-1988	DUBOIS B.F.J.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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